What is claimed is:

1. An optical amplitude modulator comprising:

a first input for receiving a continuous optical signal;

a second input for receiving a bipolar data encoded electrical signal; and

a Mach-Zehnder modulator biased at V_π for modulating the continuous signal based on the bipolar data encoded electrical signal for generating an AMI modulated optical signal having three electric field levels, +/-E and 0, and two power levels, 0 and P, such that the resultant modulated signal is both amplitude and phase modulated.

2. The modulator of claim 1 further comprising:

a bipolar electrical coder for alternating the amplitude polarity of consecutive MARK pulses of a data encoded electrical signal to generate the bipolar data encoded electrical signal that is provided to the second input of the optical amplitude modulator.

3. The modulator of claim 2 wherein the bipolar electrical coder comprises:

an input terminal for receiving a signal source comprising a unipolar NRZ (non-return-to-zero) data encoded electrical signal having a MARK pulse represented by a high level voltage and an absence of a MARK pulse by a zero voltage;

a one-bit counter connected to the input terminal for receiving the NRZ (non-return-to-zero) data encoded electrical signal and providing a counter signal having a level inversion from a previous state to an alternate state of the zero voltage or the high level voltage, every time a MARK pulse is encountered and remaining at the previous state during the absence of a MARK pulse, such the first counter pulse rises from the zero voltage to the high level voltage from a zero voltage start during the first presence of a MARK pulse;

a first inverter comprising an inverted output terminal of the counter for providing an inverted counter signal such that the inverted counter signal has a level inversion from a

previous state to an alternate state of the zero voltage or the high level voltage, every time a MARK pulse is encountered and remaining at the previous state during the absence of a MARK pulse, such the first inverted counter pulse falls from the high level voltage to the zero voltage from a high level voltage start during the first absence of a MARK pulse;

a first AND gate having input terminals connected to the inverted output terminal of the counter and to the signal source for ANDing the NRZ (non-return-to-zero) data encoded electrical signal with the counter signal to provide an odd pulse ANDed signal where only the odd pulses of the NRZ (non-return-to-zero) data encoded electrical signal are represented by a pulse;

a second AND gate connected to the input terminal for ANDing the NRZ (non-return-to-zero) data encoded electrical signal with the inverted counter signal to provide an even pulse ANDed signal where only the even pulses of the NRZ (non-return-to-zero) data encoded electrical signal are represented by a pulse;

a second inverter for changing the polarity of the even pulse ANDed signal such that the original positive-rising even pulse is represented by a negative falling pulse from the zero voltage to a negative high level voltage to provide a negative even pulse ANDed signal; and

a summer for adding the odd pulse ANDed signal with the negative even pulse ANDed signal to provide the bipolar data encoded electrical signal as an NRZ-AMI signal for transferring into an NRZ-AMI modulated optical signal having the three electric field levels, +/-E and 0, and two power levels 0 and P.

4. The modulator of claim 2 wherein the Mach-Zehnder modulator has a maximum MARK optical output pulse at a first voltage driving level +V, a maximum MARK optical output pulse at a second voltage driving level –V, a minimum optical output at a voltage level between the first and second voltage driving level and the phase of every maximum MARK optical output pulse is inverted alternately.

5. The modulator of claim 3, wherein the input terminal can also receive a unipolar RZ (return-to-zero) data encoded electrical signal having a MARK pulse represented by a high level voltage at a first portion of the bit period and a zero voltage at a remaining portion of the bit period (B) and an absence of a MARK pulse by the zero voltage to create an RZ-AMI optical signal at the output of the summer to provide an RZ-AMI signal as the output of the summer.

6. The modulator of claim 5 wherein the input terminal further comprises an NRZ to RZ converter for receiving the unipolar NRZ data encoded electrical signal at a second input terminal and converting the unipolar NRZ data encoded electrical signal to the unipolar RZ (return-to-zero) data encoded electrical signal having a MARK pulse represented by a high level voltage at the first portion of the bit period and a zero voltage at the remaining portion of the bit period (B) and an absence of a MARK pulse by the zero voltage.

7. A method of converting a unipolar voltage data stream into a bipolar optical data stream, the method comprising:

supplying a continuous optical signal to a modulator, wherein the modulator has a maximum MARK optical power output at a first voltage driving level +V, a maximum MARK optical power output at a second voltage driving level –V, a minimum optical power output at a voltage level between the first and second voltage driving level and the phase of every maximum MARK optical output pulse is inverted alternately;

encoding a unipolar voltage data stream to provide an encoded bipolar voltage data stream; and

driving the modulator with the encoded bipolar voltage data stream to generate a bipolar optical data stream such that there will be a minimum optical power output when the encoded bipolar voltage data stream stays at a midlevel between the first and the second voltage level.

8. The method of claim 7, wherein the encoding step comprises alternate MARK inversion (AMI) encoding.

9. The method of claim 7, wherein the encoding step comprises alternate MARK inversion (AMI) encoding and converting an NRZ unipolar signal to an RZ bipolar signal.

10 A unipolar electrical to bipolar optical converter, the converter comprising:

a bipolar electrical coder for alternating the amplitude polarity of consecutive MARK pulses of a data encoded electrical signal to generate a bipolar data encoded electrical signal; and

an electrical to optical modulator having an optical input for receiving a continuous optical signal, an electrical input for receiving the bipolar data encoded electrical signal, and an optical output for providing an AMI modulated optical signal having three optical electric field levels, +/-E and 0, and two optical power levels, 0 and P, when the bipolar data encoded electrical signal is applied to the electrical to optical modulator such that the resultant alternate electric fields of +/- E are in a form of phase shift keying.

11. The optical converter of claim 10 wherein the electrical to optical modulator comprises an optical amplitude modulator and the modulator having the electrical input for receiving a bipolar NRZ (non-return-to-zero) data encoded electrical signal such that the modulator converts the bipolar NRZ electrical signal to a bipolar NRZ optical signal for optical transmission in an amplitude modulated form.

12. The optical converter of claim 11 wherein the bipolar electrical coder comprises an NRZ-AMI encoder for receiving a unipolar NRZ data encoded electrical signal and generating a bipolar NRZ data encoded electrical signal in synchronism with a transmission bit rate clock signal.

13. The optical converter of claim 10 wherein the bipolar electrical coder comprises an AMI encoder for receiving a unipolar RZ data encoded electrical signal and generating a bipolar RZ data encoded electrical signal in synchronism with a transmission bit rate clock signal.

14. The optical converter of claim 10 wherein the bipolar electrical coder comprises an RZ-AMI encoder for receiving a unipolar NRZ data encoded electrical signal and generating a bipolar RZ data encoded electrical signal in synchronism with a transmission bit rate clock signal.

15. The optical converter of claim 10 wherein the electrical to optical modulator comprises a Mach-Zehnder interferometer.

16. The optical converter of claim 10 further comprising a laser for generating the continuous optical signal for use of the converter as a transmitter.

17. The optical converter of claim 10, wherein the bipolar electrical coder comprises an NRZ-AMI encoder having a limited bandwidth for generating an NRZ unipolar data encoded electrical signal with finite rise and fall times to a bandlimited NRZ bipolar data encoded electrical signal at the electrical input of the electrical to optical modulator.

18. The optical converter of claim 17 wherein the electrical to optical modulator comprises a Mach-Zehnder interferometer for converting the NRZ bipolar data encoded electrical signal at the electrical input to an NRZ-AMI modulated optical signal comprising a pseudo RZ modulated optical signal in optical form at the optical output.

19. The optical converter of claim 10, wherein the bipolar electrical coder comprises an NRZ to RZ converter coupled to an AMI encoder.

20. The optical converter of claim 19, wherein the NRZ to RZ converter comprises a data rate clocked AND gate.